

1. A rotary locking means for the spindle or the ring gear 5, e.g. the means for inhibiting unwanted movement may be a locking part or the rotary locking means lies in the gap between the spindle and the housing or the ring gear and the housing or in a specific configuration of the parts, for example a positively locking tooth configuration. The cursor is rotationally secured on the spindle by virtue of the positively locking contour of the cursor.

[0044] The components of the counter may consist of virtually any material. They are preferably made from plastic material, for example by an injection molding process. For medical purposes, physiologically harmless materials are used. It is also possible to use metal, for example steel (PST) as well as standard of PBT and Teflon (polytetrafluoroethylene). The materials are preferably so selected that different materials are applied each other, for example PBT with Teflon against PBT or PBT against acrylonitrile-butadiene-styrene.

[0045] The counter according to the invention can be used for example in a metering apparatus which serves as a high-pressure atomizer for a liquid medicament. The liquid to be atomized is disposed in a pressure-tight supply container which communicates with a melt-holding high-pressure generating means with which an aerosol is generated; for details for this respect see German laid-open application (DE-OS) No. 1 163 34 902.3 (the entire contents of which are incorporated herein by reference).

The device produces the high pressure required by operating by means of a pump-actuated locking mechanism, the spindle being driven by rotation of two locking portions which are rotated relative to each other, for details reference is directed to German laid-open application (DE-OS) No. 1 163 34 902.3 (the entire contents of which are incorporated herein by reference).

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[0047] The device produces the high pressure required by operating by means of a pump-actuated locking mechanism, the spindle being driven by rotation of two locking portions which are rotated relative to each other, for details reference is directed to German laid-open application (DE-OS) No. 1 163 34 902.3 (the entire contents of which are incorporated herein by reference).

[0048] The preferred embodiment of the invention has the following advantages:

- it is extrinsically addressed when the metering apparatus is actuated;
- it is non-critical in terms of tolerances and is therefore reliable and safe in operation;
- the transducers can be designed to cover a wide range of applications;
- it displays the number of discharged metering portions and/or the number of metering portions still available, quasi-continuously and with an adequate degree of accuracy;
- it is inexpensive and cannot be displaced by mistake when using the metering apparatus;
- it can be used for a plurality of supply containers in succession;
- it can be produced for a different number of metering portions from each supply container and for a different maximum number of supply containers which may be used with the metering apparatus;
- it is inexpensive for the metering apparatus and does not require any substantial modification thereto;
- it can be produced in multilayered form and therefore

specifies a clockwise engagement portion 11 and two counter-clockwise engagement portions 12 on the second housing projection 13 on two arms 13. The recess 9 is the friction zone for the portions 11 at the end of their travel. Preceded on the inside of the cover are two extraction means 14 which, when the cover is disposed in position, pull the cursor 8 back into the starting position at the end of the spindle by means of the master projections 12. When that happens the cursor ring 9 bears against the abutment 15 and the cursor is released as described above.

[0033] Disposed at the one end of the spindle is a four-tooth pitch 18 having two (axially) narrow teeth 17 and two (axially) wide teeth 19. The edge of the second locking portion 13 is cut to the profile of the two projections 19 and 20. The cursor 8 which is shown in FIG. 2, in its starting position, has the profile of the pitch 18. In this position, the teeth and projections are preferably of involute shape. Disposed at the other end of the spindle is the gear 22 which engages into the ring gear 23. Provided on the flange 24 of the ring gear are a plurality of numbered marks 25, of which a respective mark appears in the window 26 in the cover 3 as after a given rotary movement of the ring gear.

[0041] The position of the cursor 8 against cursor means in the form of the labelled scale 27 shows the number of metering portions taken from the supply container or the number of metering portions which can still be taken therefrom. When the supply container is empty a respective one of the numbered marks 25 appears in the window 26 in the cover 3 as after a given rotary movement of the ring gear.

[0042] The position of the cursor 8 against cursor means in the form of the labelled scale 27 shows the number of metering portions taken from the supply container or the number of metering portions which can still be taken therefrom. When the supply container is empty a respective one of the numbered marks 25 appears in the window 26 in the cover 3 as after a given rotary movement of the ring gear.

[0043] The preferred embodiment of the invention has the following advantages:

- it is extrinsically addressed when the metering apparatus is actuated;
- it is non-critical in terms of tolerances and is therefore reliable and safe in operation;
- the transducers can be designed to cover a wide range of applications;
- it displays the number of discharged metering portions and/or the number of metering portions still available, quasi-continuously and with an adequate degree of accuracy;
- it is inexpensive and cannot be displaced by mistake when using the metering apparatus;
- it can be used for a plurality of supply containers in succession;
- it can be produced for a different number of metering portions from each supply container and for a different maximum number of supply containers which may be used with the metering apparatus;
- it is inexpensive for the metering apparatus and does not require any substantial modification thereto;
- it can be produced in multilayered form and therefore

there takes up only a small amount of space;

- the individual parts of the cursor are preferably made from plastic material which operates without lubricant at a low level of friction;
- no substances can get into the substance to be measured, from the cursor;
- it comprises a small number of individual parts which can be inexpensively produced by injection molding;
- it is easy to assemble;
- the cursor can be reset each time a supply container is emptied, by the starting position of the cursor on the spindle is clearly established whenever a fresh supply container is introduced;
- the combination of a spindle which carries the extraction of the metering apparatus during use of a supply container with a second spindle or with a ring gear means that the metering apparatus can reliably be used for a predetermined total number of metering portions or for a predetermined total number of supply containers in succession. The period of use of the metering apparatus can be readily reviewed.

4. A mechanical counter according to claim 3 having

- a platen at the one end of the spindle, which is in the vicinity of the second housing portion and which provides the tooth arrangement, and
- projections on a part of the periphery of the second housing portion, which engage into the platen as a part of the rotary movement of the two housing portions relative to each other.

5. A mechanical counter according to claim 3 having

- a platen having four teeth, and
- two projections on the second housing portion.

6. A mechanical counter according to claim 3 having

- a platen with four teeth of which two oppositely disposed teeth are wider than the other two teeth, wherein a bank of the wider teeth bears against the lower peripheral surface of the second housing portion;
- two projections on the edge of the second housing portion; and
- an opening between the two projections which is larger than the width of the wider teeth of the platen.

Claims

1. A mechanical counter for a metering apparatus having two coaxially arranged housing portions which are rotated relative to each other when the metering apparatus is operated, the cursor comprising

- at least one spindle with a screw thread thereon,
- whose axis extends substantially parallel to the axis of the metering apparatus and
- which is disposed in the region of the peripheral surface of the metering apparatus and
- which is mounted in the vicinity of the spindle ends with respective rotary mountings on the two housing portions,
- a tooth arrangement at the spindle and which is closest to the second housing portion,
- at least one projection at the edge of the second housing portion, for engaging the tooth arrangement and rotating the spindle,
- a cursor movable along the spindle by the screwthread when the spindle rotates, and
- a scale which is disposed adjacent the cursor.

2. A mechanical counter according to claim 1 having

- two rotary mountings, preferably in the form of step-action mountings.

3. A mechanical counter according to claim 1 or 2 having

- the spindle has means for inhibiting unwanted movement, preferably in the form of a positively locking tooth arrangement.

4. A mechanical counter according to any one of claims 1 to 3 having

- a transmission ratio of half a spindle revolution to two actuations of the metering apparatus.

5. A mechanical counter according to any one of claims 1 to 7 having

- the pitch on the spindle screwthread is matched to the number of the metering portions and the displacement travel of the cursor.

6. A mechanical counter according to any one of claims 1 to 7 having

- the spindle has means for inhibiting unwanted movement, preferably in the form of a positively locking tooth arrangement.

7. A mechanical counter according to any one of claims 1 to 8 having

- the pitch on the spindle screwthread is matched to the number of the metering portions and the displacement travel of the cursor.

8. A mechanical counter according to any one of claims 1 to 8 having

- at least one resilient limb with a counterclockwise engagement portion on the cursor, which counterclockwise engagement portion engages into the screwthread on the spindle.

9. A mechanical counter according to claim 8 having

- the cursor can be temporarily released from the screwthread for resetting.

10. A metering apparatus according to Claims 21 or 22, including means for indicating the number of times the cursor has moved through its path of travel.

11. A metering apparatus according to Claim 21, 22 or 23 where the spindle axis is substantially parallel to the axis of rotation of the housing portions and the spindle has a gear train which cooperates with means on said other housing portion to effect rotation of the spindle.

12. A metering apparatus according to Claim 24 where the spindle is rotated during only part of the rotation of the housing portions.

13. A metering apparatus according to any one of Claims 21-23, wherein the cursor is as defined in any one of Claims 1-19.

14. A metering apparatus according to any one of Claims 20-23 which is a metered dose inhaler.

15. A metering apparatus according to any one of Claims 21-23, wherein the cursor is as defined in any one of Claims 1-19.

16. A metering apparatus according to any one of Claims 21-23, wherein the cursor is as defined in any one of Claims 1-19.

17. A metering apparatus according to any one of Claims 1 to 13 having

- a second spindle with means for inhibiting unwanted movement, which is arranged in substantially parallel relationship with the first spindle, and

- a cursor which is possibly not disengaged with rotary engagement on the second spindle, and

- a one-to-one transmission assembly comprising

- a projections wheel at one end of the first spindle and

- a gear at the corresponding end of the second spindle, into which the projection wheel of the

first spindle engages.

18. A mechanical counter according to any one of claims 1 to 13 having

- a roller, on which a helical line is drawn with a revolution over the entire length of the roller and the sections on the two sides of the helical line are marked in different ways, preferably coloured with two colours, and

- a narrow transparent strip is glued to the cover through which it lies on the peripheral surface of the roller in view, and possibly a scale besides the transparent strip.

19. A mechanical counter according to any one of claims 1 to 13 having

- a second spindle with means for inhibiting unwanted movement, which is arranged in substantially parallel relationship with the first spindle, and

- a cursor with rotary sealing on the second spindle, and

- a one-to-one transmission assembly comprising

- a tooth arrangement at the end of the second spindle, which is closest to the second housing portion, and

- projections at the edge of the second housing portion, which engage into the tooth arrangement at the end of the second spindle.

20. A metering apparatus having two coaxially arranged housing portions which are rotated relative to each other when the metering apparatus is operated, the cursor comprising

- a second spindle with means for inhibiting unwanted movement, which is arranged in substantially parallel relationship with the first spindle, and

- projections at the edge of the second housing portion, which engage into the tooth arrangement at the end of the second spindle.

21. A metering apparatus having two coaxially arranged housing portions which are rotated relative to each other when the metering apparatus is operated, the cursor comprising

- a second spindle with means for inhibiting unwanted movement, which is arranged in substantially parallel relationship with the first spindle, and

- projections at the edge of the second housing portion, which engage into the tooth arrangement at the end of the second spindle.

22. A metering apparatus according to Claim 21,

- and at the first spindle engage,

- and a scale which is disposed adjacent the cursor

- and at the second spindle.

11. A mechanical counter according to any one of claims 1 to 10 having

- at least one recessing projection on the cursor.

12. A mechanical counter according to any one of claims 1 to 11 having

- a cover over the first housing portion, which is connected hermetically in the vicinity of the cursor and covers the entire spindle, wherein the cover is transparent in a region-wise manner or comprises transparent material.

13. A mechanical counter according to claim 12 having

- at least one protrusion means on the inside of the cover.

14. A mechanical counter according to any one of claims 1 to 13 having

- a gear on the other end of the spindle, and

- a ring gear with means for inhibiting unwanted movement, preferably with a flange, with which the gear engages, and

- which is connected coaxially rotatably relative to the first housing portion.

15. A mechanical counter according to claim 14 having

- at least one fast coupling on the flange of the ring gear, which requires less than 320 degrees rotation of the ring gear relative to the first housing portion, is disposed opposite a second coupling which is in fixed position relative to the first housing portion.

16. A mechanical counter according to claim 15 having

- a second coupling on the flange of the ring gear, which requires less than 320 degrees rotation of the ring gear relative to the first housing portion, is disposed opposite a second coupling which is in fixed position relative to the first housing portion,

- or

- a window in a cover on the first housing portion.

17. A mechanical counter according to any one of Claims 1 to 13 having

- a second spindle with means for inhibiting unwanted movement, which is arranged in substantially parallel relationship with the first spindle, and

- a cursor which is possibly not disengaged with rotary engagement on the second spindle, and

- a one-to-one transmission assembly comprising

- a projections wheel at one end of the first spindle and

- a gear at the corresponding end of the second spindle, into which the projection wheel of the first

- spindle engages.

- and a cursor means, the arrangement being such that movement of the cursor with respect to the metering cursor provides a measure of the number of operations of the apparatus.

23. A metering apparatus according to Claim 21,

- and at the first spindle engage,

- and a scale which is disposed adjacent the cursor

- and at the second spindle.

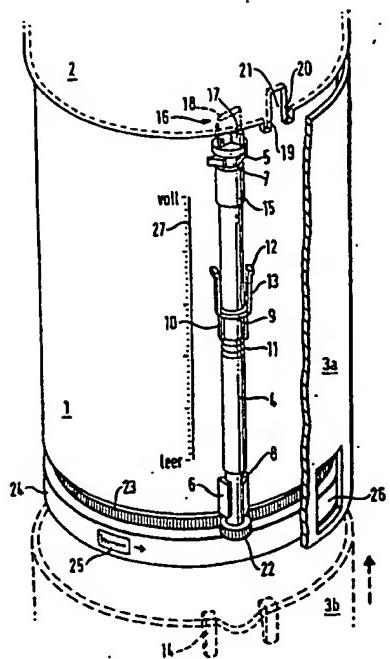


FIG.1